Trout Brook Total Maximum Daily Load (TMDL)
Draft Report

Above Highland Avenue, July 2003

Above Boothby Avenue, September 2003

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LIST OF ACRONYMS USED

BMP	Best Management Practice
CCC	Criteria Chronic Concentration (for toxic contaminants)
CMC	Criteria Maximum Concentration (for toxic contaminants)
CSO	Combined Sewer Overflow
CWP	Center for Watershed Protection
ENSR	ENSR Corporation
GIS	Geographic Information System
IC	Impervious Cover
LA	Load Allocation
MDEP	Maine Department of Environmental Protection
MRSA	Maine Revised Statutes Annotated
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint source
PETE	Partnership for Environmental Technology Education
SI	Stressor Identification
SWAT	Surface Water Ambient Toxics
SWQC	(Maine's) Statewide Water Quality Criteria
TMDL	Total Maximum Daily Load
US EPA	U.S. Environmental Protection Agency
WLA	Waste Load Allocation

PART I: WATERBODY DESCRIPTON, IMPAIRMENTS, TMDL TARGET, AND BMP IMPLEMENTATION RECOMMENDATIONS

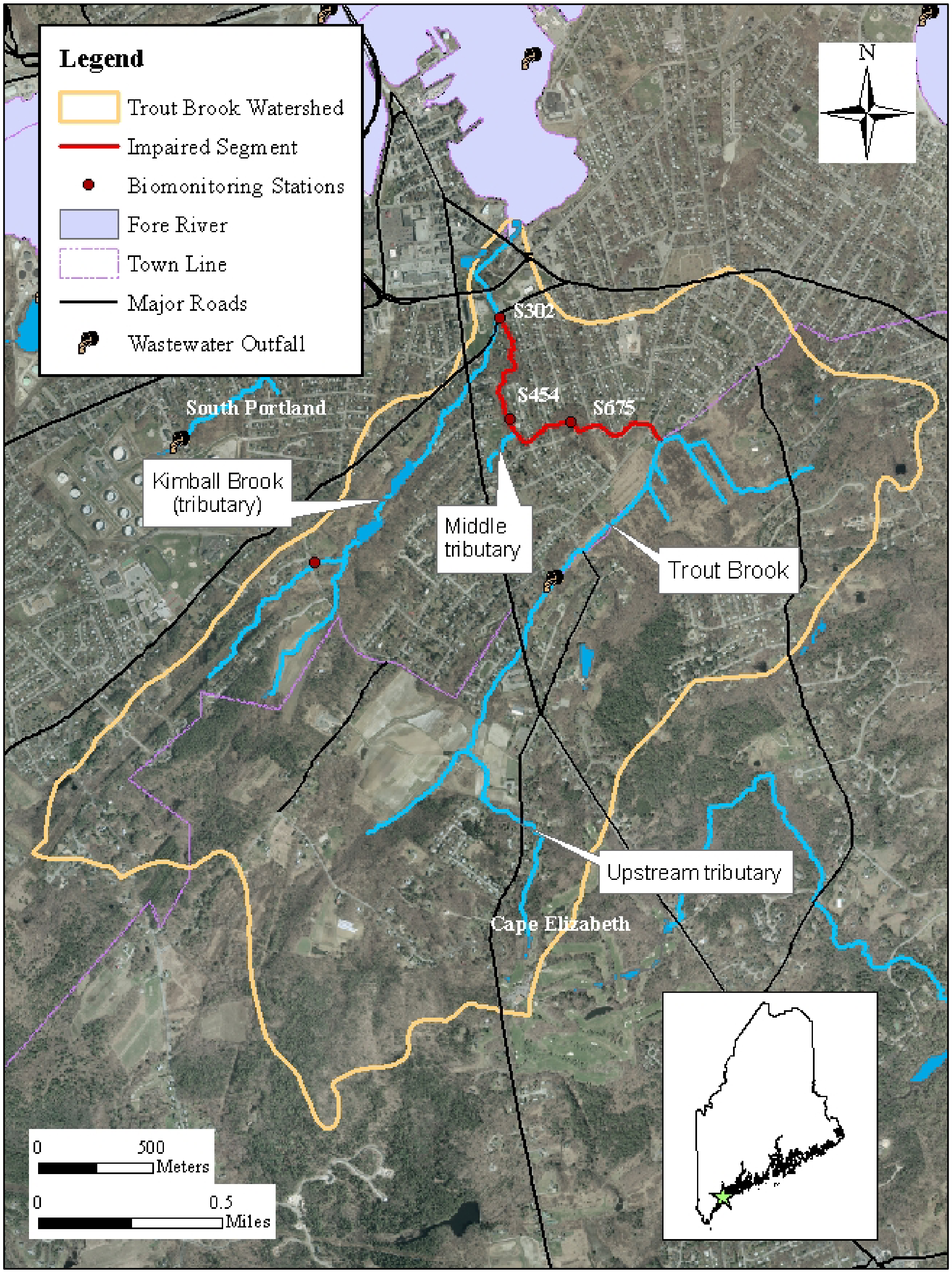
1. DESCRIPTION OF WATERBODY

Description of Waterbody and Watershed

Trout Brook (Fig. 1) is located in Cape Elizabeth and South Portland (southern Maine, 43°37'N, 70°15' W, HUC ME0106000105), and is of moderate length (~2.5 miles) and watershed size (~970 acres in Cape Elizabeth, ~730 acres in South Portland). The stream consists of a mainstem with headwaters located in a woodland west of Spurwink Avenue near Valley Road. From there, Trout Brook flows northward through mostly urban development with some agriculture and commercial development into Mill Cove, Portland Harbor, and Casco Bay. There are three tributaries to Trout Brook: the most upstream one enters the stream near the headwaters, the middle one enters it just upstream of Mayberry Street, and the most downstream one, Kimball Brook, enters Trout Brook immediately below the Highland Avenue bridge (Fig. 1). The entire watershed is classified as a "regulated area" under the NPDES Phase II Stormwater Program. Appendix A contains a set of photos of the stream.

The impaired section of the stream runs from just above (east of) Sawyer Street, at the South Portland – Cape Elizabeth town line, to the Highland Avenue bridge in the lower part of the watershed (immediately downstream of biomonitoring station S302; Fig. 1). This portion of the stream flows through dense residential development. This second-order portion of the stream largely has a wetted width of 2-3.5 m during summer baseflow conditions and a bankfull width of 4-6 m. Water depth in the summer is mostly 5-8 cm with some deeper areas. Parts of the stream were channelized in the past, resulting in an overwidened channel with little sinuosity. The stream bed is composed predominantly of rubble (40-45 %) with some gravel (20-25 %) and sand (20-35), and a few boulders (5-10 %). The morphology of this low-gradient stream is a riffle-run system with some pools. The riparian buffer consists largely of narrow (~10 m) wooded areas with an understory of herbaceous plants and ferns but lawn and the invasive Japanese Knotweed (*Polygonum cuspidatum*) have replaced the natural buffer in several areas. In the upper half of the watershed, above Sawyer Street, the riparian buffer consists of grassland, some wooded areas, and agricultural fields.

Fig. 1. Trout Brook watershed, impaired segment, and location of biomonitoring stations.



Impaired Stream Segment

Maine's 2002 and 2004 303 (d) lists (MDEP 2002b, 2004b) of waters that do not meet State water quality standards included a 2.9 mile segment of Trout Brook in South Portland that is classified as class C[1]. The Cape Elizabeth segment of the stream is classified as Class B and was not included in the listing.

At present (June 2005), the stream classification and 303 (d) listing status for the lower and upper thirds of the brook are clear (lower, South Portland: Class C and listed; upper, Cape Elizabeth: Class B and not listed). The classification and listing status of the middle segment, however, is unclear. In this segment, the South Portland – Cape Elizabeth town line passes through the center of the stream, and the appropriate classification is uncertain. Pending a final decision by the responsible parties (Board of Environmental Protection and legislature), this TMDL will consider the segment in question as Class B, and hence as not listed.

The 303 (d) listing was based on a preliminary stream assessment and sampling results from the MDEP's Biological Monitoring Program (see Description of Impairments, below). Two considerations were used to determine the extent of the impaired segment for the purposes of this TMDL. First, additional data collected in 2003 indicated that the stream reach below the Highland Avenue bridge experiences saltwater intrusions from Mill Cove in Portland Harbor (PETE/MDEP 2005). Because the water classification system used to determine impairment only applies to freshwater, this lowest reach of Trout Brook is excluded from this TMDL. Second, few data exist for the middle and upper thirds of the stream, and these segments are not known to be impaired. Based on these considerations, only the segment from the Highland Avenue bridge to just above Sawyer Street (0.9 miles in length) is impaired. As a result, this TDML covers a stream length of 0.9 miles rather than 2.9 miles as stated Maine's 303 (d) lists (see Fig. 1).

2. IMPAIRMENTS AND STRESSORS OF CONCERN

Detection of Impairments

Maine has an ongoing biological monitoring program within the MDEP, as well as biological criteria for the different classes of rivers and streams in Maine (38 MRSA § 465). The biomonitoring program uses a tiered approach to protecting aquatic life uses, and assesses the health of rivers and streams by evaluating the composition of resident biological communities (mainly benthic macroinvertebrates), rather than (or sometimes in conjunction with) directly measuring the chemical or physical qualities of the water (such as dissolved oxygen levels or concentrations of toxic contaminants)[2]. This biological assessment approach is extremely useful, especially for small streams impaired by stormwater runoff and the mix of associated pollutants, because benthic organisms integrate the full range of environmental influences and thus act as continuous monitors of environmental quality.

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[1] See Part II, section 2, Maine State Water Quality Standards for further explanation.
[2] Note that all of Maine's water quality standards have to be met for a waterbody to attain its classification.

Description of Impairments

Maine's 2002 and 2004 303 (d) lists (MDEP 2002b, 2004b) of waters that do not meet State water quality standards note "Aquatic life"[1] as the impaired use for Trout Brook with "Urban NPS" as the potential source for the impairment. This assessment was based on data collected by the MDEP Biomonitoring unit on macroinvertebrate communities in the South Portland (i.e., Class C) portion of the watershed in four different years (Table 1). In five out of the six sampling events, the aquatic life criteria for a Class C stream (see Part II, Table 1) were not attained. In addition, in 2004, samples collected at two stations did not attain Class C criteria (Table 1). Monitoring results were documented in the MDEP's SWAT (Surface Water Ambient Toxics) Program Reports (MDEP 2000, 2001a, 2002a, 2004a) as well as in the Urban Streams Project Report (PETE/MDEP 2005).

Table 1. Sampling results from MDEP's Biological Monitoring Program (upstream to downstream).

Station #	Location	Sampling Result	Years Sampled
S675	~100 m above Boothby Avenue (upstream)	NA*	2003, 2004
S454	~80 m from end of Mayberry Street (middle)	NA*	2000
S302	~20 m above Highland Avenue (downstream)	NA*	1997, 2000, 2003, 2004
		Class C	1999

* NA, Non-Attainment, i.e., the minimum requirements of Class C were not attained.

Stressors of Concern and Their Sources

The 303 (d) lists (MDEP 2002b, 2004b) and SWAT reports (MDEP 2001a, 2004a) indicated "Urban NPS" as the potential source for the impairment of the macroinvertebrate community. To gain a better understanding of specific stressors and their sources responsible for urban nonpoint source pollution in Maine, the MDEP in 2003 launched a special project to collect a large amount of biological, chemical, and physical data throughout four urban watersheds, including the Trout Brook watershed. The data collected under the "Urban Streams Nonpoint Source Assessments in Maine" project, or Urban Streams Project (PETE/MDEP 2005), were analyzed during a series of Stressor Identification (SI) workshops held in May and June 2004. For the upstream and downstream stations on Trout Brook, the SI analysis confirmed overall urban development as the primary factor responsible for stressors directly or indirectly linked to aquatic life impairments. No discreet non-stormwater point source of pollution was identified in the Trout Brook watershed although there are four stormwater outfalls that discharge into the stream, and a single combined sewer overflow (CSO) in the middle part of the watershed was scheduled for removal in spring 2005 (D. Pineo, City of South Portland, pers. comm.). Following is a list of the five stressors that were identified in the stressor identification analysis as major factors causing the impairment at one

[1] See Part II, section 2, Maine State Water Quality Standards for further explanation.

or both stations, and the data this determination was based on. Extensive documentation of sampling results is provided in Chapter 4 of the Urban Streams Report (PETE/MDEP 2005); Chapter 2 of the report details sampling methods and provides information on the SI analysis.

<u>Stressor 1: Presence of toxic contaminants</u>

Toxic contaminants include four metals that were monitored in 2003 and 2004 (Table 2). During baseflow conditions, lead and aluminum exceeded Maine's Statewide Water Quality Criteria (SWQC) CCC (Criteria Chronic Concentration). During stormflow conditions, aluminum, copper, and zinc exceeded the SWQC CMC (Criteria Maximum Concentration). The role of toxicants as a stressor was also indicated by high conductivity levels in the stream and signals from the macroinvertebrate community.

Table 2. Toxic contaminant sampling results from stations S302 (downstream) and S675 (upstream) in 2003 and 2004. *, exceeds the SWQC CCC; **, exceeds SWQC CMC.

Station	**Metal in mg/L**			
Date	**Al**	**Cu**	**Pb**	**Zn**
S302, Baseflow sampling				
September 9, 2003			0.003*	
September 7, 2004	0.100*			
S675, Baseflow sampling				
July 26, 2004	0.098*			
S302, Stormflow sampling				
May 27	0.970**	0.006**		
Nov 21		ND[1]		
S675, Stormflow sampling				
May 27	2.000**	0.007**		~0.031**
Nov 21	0.850**	ND[o]		
Criterion				
CCC	0.087	0.00299	0.0004	0.0271
CMC	0.750	0.00389	0.0105	0.0299

[o] ND, not detected at the minimum detection limit of 0.005 mg/L.

One "toxic contaminant" that was monitored indirectly (by way of continuous conductivity measurements) is saltwater that entered the stream at the downstream station in saltwater intrusions during high tide events in Portland Harbor. A maximum conductivity of 35,000 μS/cm was recorded, corresponding to a salinity of ~27 ppt (ocean salinity is ~32-35 ppt). This is a natural phenomenon at the downstream location on Trout Brook and cannot be remedied.

<u>Stressor 2: Impaired instream habitat (upstream station only)</u>

A geomorphological survey found low sinuosity and channel overwidening as a result of extensive channelization (60 % of total stream length; Field 2003). High flow volumes and their effects were observed near this station after storm events (Appendix A, Fig. 7).

Stressor 3: Impaired riparian habitat (downstream station only)

No qualitative data exist for this stressor but an absence or reduction in width of the riparian buffer was observed in places near the downstream station (Appendix A, Fig. 12).

Stressor 4: Altered hydrology (both stations)

Land use analysis showed that ~15 % of the impaired watershed consists of impervious areas (see Part II, section 3) which may lead to numerous changes in watershed hydrology. A geomorphological survey (Field 2003) found evidence of channelization which can affect natural flow patterns (Appendix A, Fig. 9).

Stressor 5: Low dissolved oxygen (upstream station only)

Instantaneous and continuous data of DO concentrations collected in the summer of 2003 were below the required level of 5 mg/L on several occasions (see Fig. 2 for diurnal DO data). Discussions with a MDEP geologist and a DO profile collected above this station suggest that the decreased concentrations at this station are caused by an input of (perched) groundwater and can be considered to be partly natural. However, channel modifications and sewage input from a CSO probably also contributed to reduced DO concentrations.

Fig. 2. Diurnal dissolved oxygen at upstream station (S675) in 2003.

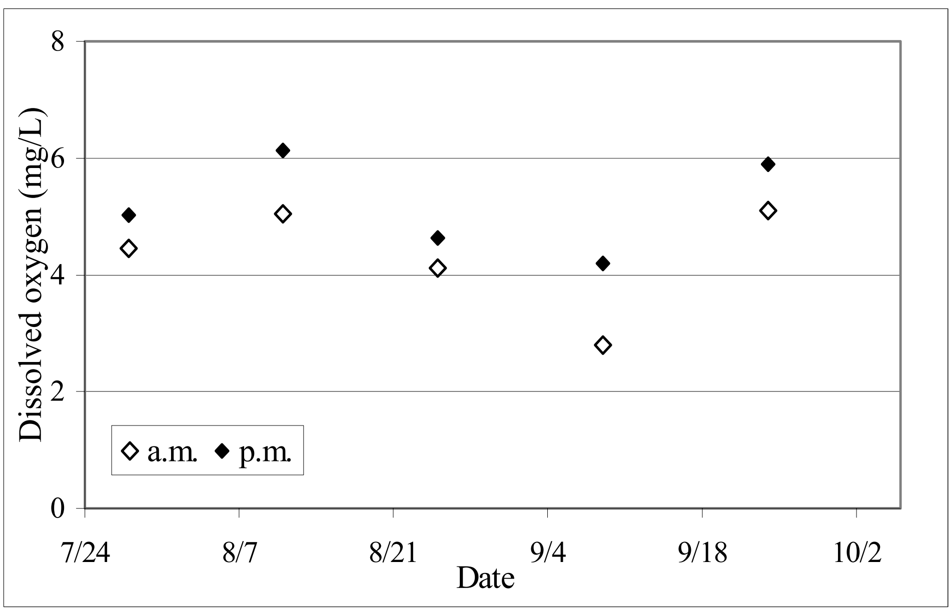


Table 3 lists the likely and possible sources responsible for the stressors identified during the stressor identification analysis. Some identified sources (italicized in Table 3) represent natural conditions, while several sources (highlighted in Table 3) are related to watershed imperviousness. For example, for the stressor 'Presence of toxic contaminants', the following sources are all linked to impervious surfaces present in the watershed: runoff from local roads and parking lots; dumping; winter road sand and road dirt; documented spills; sewage input from CSO; and sewage leaks. These sources and the resulting stressor are generally absent, or of minor importance, in non-urbanized watersheds. Recent studies (as summarized in CWP 2003) have shown that the percentage of impervious cover (IC) in a watershed strongly effects the health of aquatic systems because land surfaces that block infiltration of rainwater cause increased amounts of stormwater to run off into gutters, untreated storm sewers or directly to streams. In general, stream quality declines as imperviousness exceeds 10 % of watershed area, and may be severely compromised at greater than 25 % (Schueler 1994, CWP 2003). In Maine, existing local data indicate that an impervious cover of 10-15 % is adequate for attainment of Class C aquatic life criteria (MDEP 2005).

Table 3. Identified stressors and their sources in the Trout Brook watershed*. Sources representing natural conditions are italicized, those that are related to impervious surfaces are highlighted.

Stressor	Importance		Sources	
	Down-stream	Up-stream	Likely	Possible
1) Presence of toxic contaminants	High	High	Runoff from local roads and parking lots	Winter road sand and road dirt
			Dumping	*Natural sources*
			Saltwater intrusions	Agricultural runoff
				Atmospheric deposition
				Documented spills
				Sewage input from CSO
				Sewage leaks
2) Impaired instream habitat	-	Medium	Channelization	
			Low gradient	
			Increased storm flow volume	
3) Impaired riparian habitat	Medium	-	Reduced riparian tree cover	
4) Altered hydrology	Low	Medium/ low	High percentage of impervious surfaces	Increased consumptive uses
			Stormwater outfalls	
			Channelization	
5) Low dissolved oxygen	-	Medium/ low	*Perched groundwater*	*Low channel gradient*
				Channel modifications
				Sewage input from CSO

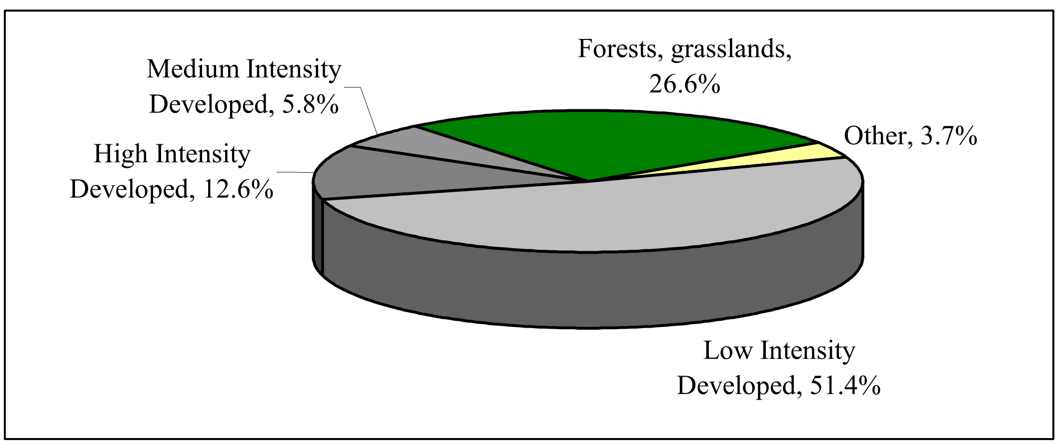
* Note that the SI process analyzed the role of stressors and their sources within the entire watershed, not only the impaired watershed.

3. IMPERVIOUS COVER AND LANDUSE INFORMATION

Urban development primarily affects aquatic systems due to the high percentage of impervious cover (IC) present in urban areas. Effects include impairments in water quality, stream morphology, hydrology (Appendix A, Figs. 6-11), and aquatic communities (CWP 2003). For Trout Brook, the relationship between IC and the stressors identified for this waterbody is shown in Table 3. The parameter "impervious cover" serves as a surrogate for a variety of impairments that are related to stormwater runoff because it relates the primary causal factors to specific impairments (ENSR 2004). Stormwater runoff is water that does not soak into the ground during a rain storm but flows over the surface of the ground until it reaches a nearby waterbody. Stormwater runoff often picks up pollutants such as soil, fertilizers, pesticides, animal waste, and petroleum products. These pollutants may originate from driveways, roads, golf courses, and lawns located within a watershed[1]. The negative effects of urban stressors on overall stream quality can be reduced by disconnecting impervious surfaces from the stream so that runoff does not reach a waterbody untreated, or by converting impervious surfaces to pervious surfaces. Implementation of other measures that address habitat restoration, riparian recovery, and flood plain recovery can be an effective and less costly first step in abatement. More information on these Best Management Practice (BMP) options is provided in section 5, Implementation Recommendations.

The % impervious cover in the Trout Brook urbanized watershed draining into the impaired segment (Part II, Fig. 1) was determined from landuse data and a conversion of landuse to % IC. Details regarding this procedure are given in Part II, section 3. Landuse is dominated by low, medium, and high intensity development, which accounts for 70 % of all landuse types (Fig. 3; see also Part II, Table 2, Fig. 1). Forests and grasslands account for another 27 % while other smaller landuses account for ~4 %. Converting landuse to % IC, imperviousness in the relevant watershed was estimated to be 15 %. This percentage reflects the total amount of impervious cover in this watershed.

Fig. 3. Distribution of landuse types, with percentages, in the Trout Brook watershed.



[1] For more information on stormwater issues visit the MDEP Nonpoint Source Pollution website at www.maine.gov/dep/blwq/doceducation/nps/background.htm

4. TOTAL MAXIMUM DAILY LOAD (TMDL) TARGET

Details regarding the determination of the TMDL target set for Trout Brook are given in Part II of this document, and a brief summary is provided here. For further details please consult Part II.

Non-attainment of water quality criteria in Trout Brook suggests that this stream has exceeded its loading capacity, namely the mass of pollutants a waterbody can receive over time and still meet water quality targets. The Stressor Identification (SI) analysis indicated that urban stressors have caused the impairment in the macroinvertebrate community and the failure to attain aquatic life criteria. “Urban stressors” is a catch-all term encompassing a wide variety of effects caused by urbanization, with the majority of the effects being related, directly or indirectly, to stormwater runoff from impervious surfaces. Because of the major effect stormwater runoff has on aquatic systems (CWP 2003), the “Impervious Cover Method” (IC method), as employed by ENSR in a pilot TMDL (ENSR 2004), is used here to estimate current and target annual runoff volumes and annual pollutant loads for Trout Brook based on a target % IC of 11 %. Parameters used in load estimates are annual runoff, annual rainfall, pollutant concentration in runoff (event mean concentrations), and watershed area. The target % IC was determined in accordance with MDEP guidance (MDEP 2005) using MDEP data, information from the literature, and local conditions.

5. IMPLEMENTATION RECOMMENDATIONS

The goal of this TMDL is to have Trout Brook meet applicable water quality criteria, that is to have the macroinvertebrate community attain Class C standards. Impairments observed in the aquatic communities in Trout Brook have been attributed to urban stressors, including additional stormwater runoff from impervious surfaces. Stormwater effects can be lessened, water quality improved, and impairments curtailed by implementing best management practices (BMPs) and remedial actions in a cost-effective manner using the following adaptive management approach:

- Implement BMPs strategically through a phased program which focuses on getting the most reductions, for least cost, in sensitive areas first (for example, begin with habitat restoration, flood plain recovery, and treatment of smaller, more frequent storms);
- Monitor ambient water quality to assess stream improvement;
- Compare monitoring results to water quality standards (aquatic life criteria);
- Continue BMP implementation in a phased manner until water quality standards are attained.

Generally speaking, these abatement measures can take one of three forms: they can consist of general stream restoration techniques (including flood plain and habitat restoration), they can disconnect impervious surfaces from the stream, or they can convert impervious surfaces to pervious surfaces. In general, practices that achieve multiple goals are preferred over those that achieve only one goal (ENSR 2004). For example, installing a detention basin along with runoff treatment systems provides more effective abatement of stormwater pollution than installing detention BMPs alone. Because of the effort and cost involved in implementing BMPs, a long-term strategy can be used to achieve water quality standards. For example, lower cost general stream restoration techniques that lessen stormwater effects immediately can be implemented in the short-term to initiate stream recovery.

This TMDL sets a target of 11 % impervious cover (IC). This target, and the current extent of IC of 15 %, reflect the total amount of impervious cover in the Trout Brook watershed. For practical purposes, the IC calculations in this TMDL do not distinguish between directly connected and disconnected surfaces. In any watershed, the runoff from impervious cover reaches the stream through both direct and indirect conduits that represent varying levels of stormwater treatment. A comprehensive sub-watershed survey of outlet structures and storm drainages would be needed to completely evaluate the amount of 'effective'[1] versus 'total' IC. Municipalities and entities that own extensive impervious surfaces are encouraged to conduct such surveys. Because effective IC presents the greatest pollution risk, efforts to disconnect or convert impervious surfaces should be directed primarily at these areas to ensure maximum benefit. This approach is likely to accelerate stream recovery and reaching the goal of this TMDL, i.e., attainment of water quality criteria. If criteria are attained before the target % IC is reached, the need for further reductions in impervious cover would be reduced (or possibly eliminated). It should be noted, however, that while a sub-watershed survey would be ideal for comprehensive planning towards stream restoration, immediate stormwater remediation may be more beneficial in the short run. Disconnecting 'hot spots' and installing bioretention structures may move the stream closer to the water quality target than documenting the current extent of effective IC.

The following three sections list the options available for BMPs aimed at stream restoration techniques, and disconnection and conversion of impervious surfaces. Because many factors must be considered when choosing specific structural BMPs (e.g., target pollutants, watershed size, soil type, cost, runoff amount, space considerations, depth of water table, traffic patterns, etc.), the sections below only suggest categories of BMPs, not particular types for particular situations. Implementation of any BMPs will require site-specific assessments and coordination among local authorities, industry and businesses, and the public. Advice on the selection, design, and implementation of any remedial measures can be obtained from the MDEP (Bureau of Land and Water Quality, Division of Watershed Management), the Cumberland County Soil and Water Conservation District, or web-based resources (see Appendix B for suggestions).

In summary, implementation of remedial measures will occur under an adaptive management approach in which certain measures are implemented, their outcome and effectiveness evaluated, and future measures selected so as to achieve maximum benefit based on new insights gained. This process may be repeated several times, starting with the most appropriate measures for the area. The order in which measures are implemented should be determined with input from all concerned parties (e.g., city, businesses, industry, residents, regulatory agencies, watershed protection groups). It is suggested that the City develops implementation recommendations by the end of 2006 and presents them to the watershed stakeholders and, if desired, the MDEP or the Cumberland County Soil and Water

[1] 'Effective' IC is impervious cover that that is directly connected to the stream via hard surfaces or in close proximity, and from which runoff enters a waterbody untreated.

Conservation District. Further details on the measures suggested below is provided in Chapter 4 of the Urban Streams Report (PETE/MDEP 2005). In addition, Appendix C lists BMPs in a matrix format in which traditional and newly developed ("Low Impact Development") BMP types are rated according to their ability to mitigate for impacts of impervious cover and applicability to certain urban situations (ENSR 2005). The matrix was developed by ENSR as a multi-use tool and thus contains some BMPs and IC impacts not directly applicable to Trout Brook.

<u>General Stream Restoration Techniques</u>

Following is a list of general BMPs and stream restoration techniques and how they can alleviate stressors and improve stream health. Short-term implementation of these measures will complement the long-term strategy of disconnecting or removing impervious surfaces suggested above. Web-based information resources that can aid with planning and implementing these measures are given in Appendix B.

- Maintaining the riparian buffer where it is adequate, i.e., has a width of at least 23 m (75 feet), wherever possible, and is composed of native plants, including mature trees. Enhancing or replanting the riparian buffer where it is inadequate. An adequate buffer will filter runoff from commercial and residential lots, improves shading (which helps to keep water temperature low), and increases large woody debris availability, and food input. It will also provide terrestrial and aquatic habitat for insects with aquatic life stages, thus enhancing recolonization potential of the macroinvertebrate community.
- Reclamation of flood plains by returning these areas to a natural state will naturally moderate floods; reduce stress on the stream channel; provide habitat for fish, wildlife, and plant resources; promote groundwater recharge; and help maintain water quality. Protection of intact flood plains should be a high priority.
- Improving channel morphology (restoring sinuosity, pool availability and diversity, and flow diversity) by installing double wing deflectors and low crib walls in the stream (see PETE/MDEP 2005, Chapter 4, Fig. 24) will improve flow conditions and habitat for macroinvertebrates. Because of the complex nature of channel restoration, any improvement activity requires the extensive involvement of a trained professional.
- Reducing the incidence of spills (accidental and deliberate) for example by improving education and training will reduce toxic contaminant input.
- Reducing the input of winter road sand and road dirt by sweeping roads, parking areas or driveways will reduce excess sedimentation.
- Minimizing waste input from pets by picking up waste will reduce bacteria and nutrient input.
- Minimizing lawn/landscaping runoff by minimizing fertilizer/pesticide use and using more efficient application methods will reduce nutrient and toxic contaminant input.
- Eliminating the potential for sewer/septic system leaks by regularly inspecting and maintaining sewer/septic systems will reduce toxic contaminant and nutrient input.
- Eliminating illicit discharges by detecting and eliminating discharges will reduce toxic contaminant and nutrient input.

- Reducing erosion from land use activities with mulches, grass covers, geotextiles or riprap will reduce the potential for sedimentation problems. In streambank stabilization projects, use of woody vegetation is preferred over riprap in most cases.
- Investing in education and outreach efforts will raise public awareness for the connections between urbanization, impervious cover, stormwater runoff, and overall stream health.
- Encouraging responsible development by promoting Smart Growth or Low-Impact Development guidelines and the use of pervious pavement techniques will minimize overall effects of urbanization.
- Reducing new impervious cover by promoting shared parking areas between homes or between facilities that require parking at different times will reduce impacts related to impervious surfaces. Lowering minimum parking requirements for businesses and critically assessing the need for new impervious surfaces will have the same effect.
- Reducing the temperature of water discharged from (future) detention structures by including outlet mechanisms (e.g., underdrains) that cool the discharge will reduce the potential for negative temperature effects on the stream.
- Eliminating the few septic systems in the watershed by expanding the municipal sewer system will reduce toxic contaminant and nutrient input. Given low potential for problems arising from septic systems and the high cost required for abatement, this is not considered a high-priority item.
- Eliminating sewage input from the CSO will reduce toxic contaminant and nutrient input. (The single CSO in the watershed was disconnected in spring 2005; D. Pineo, City of South Portland, pers. comm.)

<u>Disconnection of Impervious Surfaces</u>

The purpose here is to prevent stormwater runoff from reaching the stream directly (via the storm drain system). There are various options for achieving this goal:

- Channel runoff from large parking lots, roads or highways into
  - detention/retention BMPs (e.g., dry/wet pond, extended detention pond, created wetland), preferably one equipped with a treatment system (e.g., underdrains);
  - vegetative BMPs (e.g., vegetated buffers or swales);
  - infiltration BMPs (e.g., dry wells, infiltration trenches/basins, bio-islands/cells);
  - underdrained soil filters (e.g., bioretention cells, dry swales).
- Redesign and retrofit existing detention to provide extended detention for 6 month and 1 year storms.
- Guide runoff from paved driveways and roofs towards pervious areas (grass, driveway drainage strip, decorative planters, rain gardens).
- Remove curbs on roads or parking lots.
- Collect roof runoff in rain barrels and discharge into pervious areas.

All of these options for disconnection of impervious surfaces provide for a virtual elimination of runoff during light rains (which account for the majority of runoff events but not the majority of pollutant or stormwater input), reduction in peak discharge rate and volume during heavy rains, sedimentation or filtration of some pollutants, and improvement in groundwater recharge. Disconnection of impervious surfaces can often be achieved at reasonable cost and, unlike the removal of impervious surfaces (below), does not generally create material for disposal. These BMPs cover most sizes of impervious surfaces (private driveways and small building roofs to large parking lots and highways), and many have been widely used in cold climates.

Conversion of Impervious Surfaces

This is achieved by replacing impervious surfaces with pervious surfaces, for example by using the following BMPs:

- Replace asphalt on little-used parking lots, driveways or other areas with light vehicular traffic with porous pavement blocks or grass/gravel pave.
- Replace small areas of asphalt on large parking lots with bioretention structures (bio-islands/cells).
- Replace existing parking lot expanses with more space-efficient multistory parking garages (i.e., go vertical).
- Replace conventional roofs with green roofs.

These options for conversion of impervious surfaces also provide for a virtual elimination of runoff during light rains (which account for the majority of runoff events), reduction in peak discharge rate and volume during heavy rains, filtration of some pollutants, and improvement in groundwater recharge. However, a number of problems exist with these options (e.g., removed asphalt or roofing shingles must be landfilled or recycled), and removal of existing impervious surfaces may be operationally unfeasible. Some of these BMPs are still in the experimental stage for cold climates and may not prove suitable for widespread implementation. Use of these BMPs may therefore be limited to relatively few instances. As far as possible, construction or building projects should, however, consider these and other possibilities for reducing new impervious cover during the planning stages.

6. MONITORING PLAN

Maine DEP will evaluate the progress towards attainment of Maine's water quality standards by monitoring the macroinvertebrate community in Trout Brook under the Biomonitoring Unit's existing rotating basin sampling schedule. At the same time, the Streams TMDL unit will collect water chemistry samples during stormflow conditions to determine whether acute criteria of the Maine Statewide Water Quality Criteria for certain toxic contaminants or sediment are exceeded. Adaptive implementation of the remedial measures listed above should be pursued until aquatic life criteria are met. Once criteria have been met in at least two sampling events with normal summer conditions within a 10-year period (i.e., by 2015), no further remedial measures are required. If criteria continue to be violated once BMPs and restoration techniques have been implemented and the IC has been reduced to 11 %, this TMDL will enter a secondary phase in which the approach proposed in this document will be reassessed.

PART II: TMDL PLAN

1. PRIORITY RANKING, LISTING HISTORY, AND ATMOSPHERIC AND BACKGROUND LOADING

Priority Ranking and Listing History

The large number of streams listed for nonpoint source (NPS) pollution on the 303 (d) list requires Maine to set priority rankings based on a variety of factors. Factors include the severity of degradation, the time duration of the impairment, and opportunities for remediation. Maine has set priority rankings for 303 (d) listed streams by TMDL report completion date, and has designated Trout Brook for completion by 2005. Trout Brook's priority ranking was raised on the 2004 303 (d) list (MDEP 2004b) when the stream was included in the Urban Streams NPS Assessment Project (PETE/MDEP 2005).

Atmospheric Deposition

Atmospheric deposition of pollutants that occurs within a watershed will reach a stream through runoff containing material deposited on land, direct contact of the stream with rain, and the settling of dry, airborne material on the stream surface. As for contaminated runoff, it is assumed that in watersheds with a relatively low percent imperviousness enough soil remains that most atmospherically deposited metals are buffered and adsorbed before they can reach the stream (except in watersheds sensitive to acidification). Where imperviousness is elevated, as in the urbanized Trout Brook watershed draining into the impaired segment (15 %), it is unknown whether (or how much) material deposited from the atmosphere reaches a stream with runoff. A reduction in the % impervious cover (IC) in the watershed would help in reducing any negative effects from pollutants derived from the atmosphere. However, because this type of pollution originates from very diffuse and potentially far-away and wide-spread sources, national action is required to deal with this issue effectively. Other potential sources (i.e., direct contact with rain, and deposition in the stream of airborne material) are considered to convey minimal loads to Trout Brook because of the small surface area of the stream channel itself. On a larger scale, i.e., for Casco Bay, research has shown that atmospheric deposition accounts for a significant percentage of the inorganic nitrogen and mercury loading to the Bay (Sonoma Technology 2003).

Natural Background Levels

Although the headwaters of Trout Brook are in what could be called a "largely natural setting", even this section is influenced by urban development (logging, some residential development; see Fig. 1). As a result, no information on natural background levels of pollutants in this watershed is available. In general, it is difficult to separate natural background loads from the total nonpoint source load (US EPA 1999), and the information would not contribute significantly to the analysis for this TMDL.

2. DESCRIPTION OF THE APPLICABLE WATER QUALITY STANDARDS

Maine State Water Quality Standards

Water quality classification and water quality standards of all surface waters of the State of Maine have been established by the Maine Legislature (Title 38 MRSA 464-468). According to Maine's Water Classification Program, the impaired segment of Trout Brook is classified as Class C (see Part I, section 1), and the applicable water quality standards are shown in Table 1. The Maine Legislature also defined designated uses for all classified waters, which state that "Class C waters shall be of such quality that they are suitable for the designated uses of drinking water supply after treatment; fishing; recreation in and on the water; industrial process and cooling water supply; hydroelectric power generation, except as prohibited under Title 12, section 403; and navigation; and as habitat for fish and other aquatic life."

Table 1. Maine water quality criteria for classification of Class C streams (38 MRSA § 465).

Numeric Criterion	**Narrative Criteria**	
Dissolved Oxygen	**Habitat**	**Aquatic Life (Biological)**
5 ppm; 60% saturation	Habitat for fish and other aquatic life	Discharges may cause some changes to aquatic life, provided that the receiving waters shall be of sufficient quality to support all species of fish indigenous to the receiving waters and maintain the structure and function of the resident biological community.

Antidegradation Policy

Maine's anti-degradation policy requires that "existing in-stream water uses and the level of water quality necessary to sustain those uses, must be maintained and protected." (For designated uses of a Class C stream see previous section.) Additionally, MDEP must consider aquatic life, wildlife, recreational use, and social significance when determining "existing uses".

3. TMDL TARGET: LOADING CAPACITY AND IMPERVIOUS COVER

Loading Capacity

Loading capacity is the mass of pollutants that a waterbody can receive over time and still meet numerical or narrative water quality targets. Trout Brook currently does not meet Maine's aquatic life criteria for a Class C stream (Table 1), suggesting that its loading capacity is exceeded. For streams in urbanized areas, additional stressors affecting aquatic life exist in the form of non-pollutant impacts such as alterations in channel morphology and the flow regime, or degradation of the riparian buffer. Stressors should be controlled to bring the stream into compliance. In this TMDL, the extent of impervious cover (% IC) in the watershed is used as a surrogate for the complex mixture of pollutant and non-pollutant stressors attributable to urban development, especially stormwater effects. By reducing the % IC using the options listed above in Part I, section 5, Implementation Recommendations, a number of urban stressors and their sources can be addressed simultaneously (e.g., toxic load from runoff and road sand; habitat impairment due to high storm flows; hydrologic alterations due to high imperviousness and stormwater outfalls). The use of imperviousness as the TMDL target requires the application of the Impervious Cover Method.

Impervious Cover (IC) Method

The IC Method was developed by the Center for Watershed Protection (CWP) to assess the impacts of urbanization on small streams and receiving waters, and to document the linkage between the % impervious cover in watersheds and instream water quality. The IC Method was used by ENSR in a pilot project to develop TMDLs for streams potentially impaired by urban nonpoint source pollution (ENSR 2004). ENSR selected the IC Method for their pilot project "primarily because it provides a strong and straightforward link between water quality impairment and causal factors" (ENSR 2004). The IC Method can be used to estimate current annual runoff volume and loads for a range of pollutants using the current extent of watershed imperviousness (for current % IC determination see following section). The IC Method can also be used to estimate target volumes and loads based on a target extent of imperviousness. In this TMDL, target pollutant loads are presented primarily to describe potential loadings and determine load reductions. They do not represent end-of-pipe loadings, or loadings for individual storms. Rather, they represent total loads of pollutants entering a stream during small and large rainfall events occurring throughout the year and originating from non-distinct sources. Estimates shown here are therefore not appropriate for use in a permitting, enforcement, or monitoring context.

Impervious Cover and Landuse Information

As a first step for calculating the % impervious cover in the Trout Brook watershed, the watershed boundary (Part I, Fig. 1) was determined. In addition to the watershed directly draining into the impaired segment, areas draining into the middle third of the stream were included because of the proximity to the impaired segment and the amount of urbanization present. The upper third of the watershed was excluded here because of its overall rural character. The watershed boundary was determined based on a drainage map obtained from the City of South Portland and actual stormwater drainage systems in South Portland. Watershed imperviousness was estimated from landuse data and a conversion of landuse to % IC. Landuse data were derived from "Maine_Combo_Landcover", a GIS map layer developed by MDEP staff that combines data from Maine Gap Analysis Program (GAP) and USGS Multi Resolution Landcover Characterization (MRLC) coverages[1]. Both GAP and

[1] To minimize uncertainties in precise landuse type (e.g., different types of urban developments, forests or wetlands), the original 19 "Maine_Combo_Landcover" types present in the Trout Brook watershed were grouped into the eight generalized types shown in Fig. 1.

MRLC are based on 1992 Land-Sat TM satellite imagery. Metadata for Maine_Combo_Landcover are maintained by MDEP's GIS unit. Within the relevant watershed, land use is dominated by low, medium, and high intensity development, which accounts for 70 % of all landuses (Table 2, Fig. 1). Forests, and grasslands account for 27 % while other smaller landuses account for ~4 %.

Table 2. Extent of various landuse types in the Trout Brook watershed. Letters b-e shown in the first column refer to the land cover types listed in Table 3. (Note: different terms are used here than in Table 3 for landuse types b-e to more accurately reflect actual landuse; also see footnote to Table 3.)

Landuse Type		Acres	%
e	Low Intensity Developed	363	51.4
-	Forests, Grasslands	188	26.6
b, c	High Intensity Developed	89	12.6
d	Medium Intensity Developed	41	5.8
-	Other*	27	3.7
-	Total watershed area	708	100.0

* "Other" landuse categories are [in order of decreasing area (<22 acres) or percentage (≤3.1 %)] Wetlands, Water, and Nonvegetated.

The method used to convert landuse to % IC was developed by MDEP staff (MDEP 2001b) by applying a % imperviousness formula to the "Maine_Combo_Landcover" GIS layer. The resulting values for imperviousness of certain land cover types in Maine are presented in Table 3. Calibration (i.e., groundtruthing) of the method led to the addition of a multiplier to give a final formula for watershed % IC of:

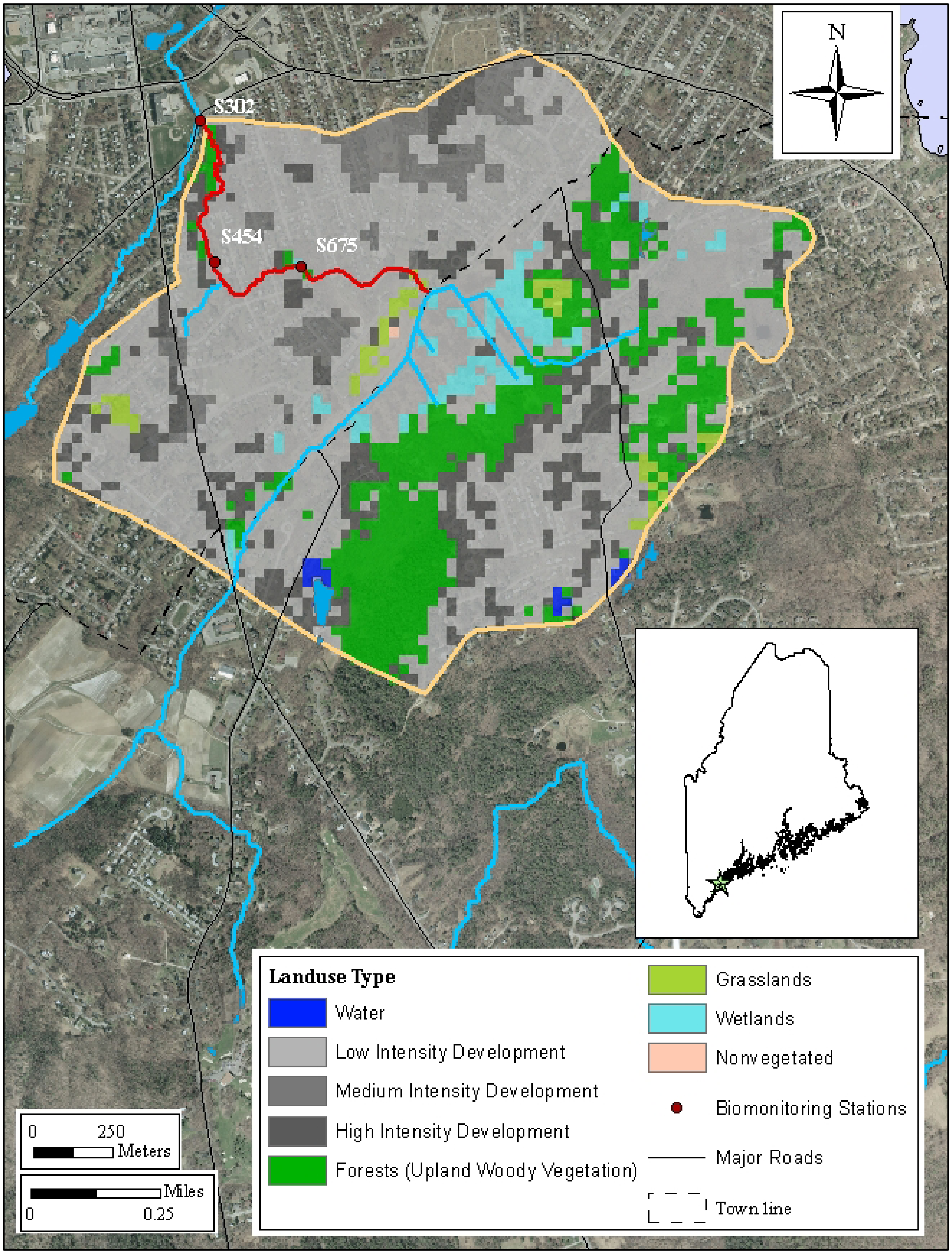
$$\text{Watershed \% IC} = 0.85 * \left(\frac{\sum_{a}^{f} (\text{Acres of landuse type} * \text{Estimated \% IC})}{\text{Total watershed area}} \right)$$

Where Acres of landuse type a-f[1] = see Table 2
Estimated % IC for land cover type a-f[1] in Maine = see Table 3
Total watershed area = see Table 2

Using this formula, % IC for the Trout Brook watershed was estimated to be 14.7 %. It is not known how much of this IC is impervious cover that is directly connected to the stream via hard surfaces or in close proximity, and from which runoff enters a waterbody untreated.

[1] Landuse types 'a' and 'f' do not occur in this watershed.

Fig. 1. Landuse in the Trout Brook watershed



Note: some land along Trout Brook upstream of the impaired segment was incorrectly identified as "Low Intensity Development". This misidentification was changed manually to "Grasslands" before landuse extent and % IC were calculated.

Table 3. Estimated % impervious cover (IC) for urban land cover* types in the "Maine_ Combo_Landcover" GIS map layer (MDEP 2001b). Letters a-f shown in the first column refer to the landuse types listed in Table 2.

Land Cover Type		Estimated % IC
a	Urban Industrial	90.20
b	Dense Residential Developed	56.50
c	Commercial-Industrial-Transportation	54.04
d	High Intensity Residential	27.11
e	Low Intensity Residential	17.26
f	Sparse Residential Developed	11.98

* Because of the way land cover types were derived from two GIS datasets, terms used here do not necessarily reflect the actual landuse (e.g., residential). Land cover types do, however, accurately reflect the extent of imperviousness due to development associated with each category.

Estimation of Pollutant Loads

The Impervious Cover Method uses the percentage of IC in a watershed and other relevant parameters such as annual runoff, annual rainfall, pollutant concentration in runoff (event mean concentrations, EMC), and watershed area to estimate current and target annual stormwater runoff volumes and annual loads of pollutants (e.g., metals, nutrients, sediment). The following three-step process is employed to estimate values (ENSR 2004):

1. Calculate Runoff Volume Coefficient

$$\mathbf{Rv = 0.05 + 0.9\ Ia}$$

Where Rv = Runoff Volume Coefficient
Ia = Impervious fraction

2. Calculate Annual Runoff Volume

$$\mathbf{R = P * Pj * Rv}$$

Where R = Annual runoff (inches)
P = Annual rainfall (inches)
Pj = Fraction of rainfall events producing runoff

3. Calculate Annual Pollutant Load

$$\mathbf{L = R * C * A * U}$$

Where L = Annual pollutant load (lbs)
C = Pollutant concentration in stormwater (mg/L)
A = Watershed area (acres)
U = Unit conversion factor, 0.226

Parameter values can be obtained from the published literature or from local sources, and are most useful if they are region-specific. Table 4 shows the parameter values and their sources that were used for the annual load calculations for Trout Brook as shown in Table 5. The pollutants included in Tables 4 and 6 were identified as significant stressors for Trout

Brook (toxic contaminants; Part I, Table 3). Pollutant concentrations from the general literature were used here for load calculations because only two data points were available from storm sampling in the Trout Brook watershed (MDEP/PETE 2005).

Table 4. Parameter values for IC model and their sources.

Parameter		Value	Source
Ia	Impervious fraction	14.7 %	GIS analysis
P	Annual rainfall (inches)	44.0 in	Portland Jetport (www.worldclimate.com)
Pj	Fraction of rainfall events producing runoff	0.9	CWP 2003
C	Pollutant concentration in stormwater (mean event mean concentration, EMC)	mg/L	CWP 2003 (Table 16)
	Cadmium	0.0007	
	Chromium	0.0040	
	Copper	0.0134	
	Lead	0.0675	
	Zinc	0.1620	
A	Watershed area (acres)	708	GIS analysis

Using the parameters in Table 4 in the three-step process shown above, annual runoff volume and annual pollutant loads at the current % IC and at a target (lower) % IC can be estimated. An appropriate target % IC for Trout Brook was selected by considering local conditions (ameliorating and exacerbating) within the framework of the target % IC range of 10-15 % established by MDEP for Class C waterbodies (MDEP 2005). Given the existence of more extensive exacerbating than ameliorating conditions (Table 5) and the presence of a sensitive species (brook trout) in the stream, a target % IC of 11 % was set for Trout Brook. Using this target % IC would reduce the projected stormflow runoff volume and pollutant load by 18 % (Table 6). As explained in "Impervious Cover Method", above, estimates shown in Table 6 are not appropriate for usage in a permitting, enforcement, or monitoring context.

Table 5. Conditions considered in selection of target % impervious cover for Trout Brook.

Ameliorating conditions	Exacerbating conditions
Presence of a riparian buffer >10 m in width along 44 % of the stream (PETE/MDEP 2005)	Absence of riparian buffer along 39 % of the stream (PETE/MDEP 2005)
Documented cold water input (PETE/MDEP 2005)	Wetland likely contributing to elevated water temperature and lowered dissolved oxygen (DO) concentration
	Naturally low DO concentration in part of stream (PETE/MDEP 2005)
	Impermeable soils (clays and silts of glacial-marine origin) reducing infiltration potential
Natural flood plain along ~44 % of stream within relevant watershed*	Compromised flood plain along ~56 % of stream within relevant watershed [1]

* Estimated from Fig. 1.

Table 6. Estimated annual stormwater runoff volume and annual loads for toxic contaminants in Trout Brook at current and target % impervious cover (IC).

Pollutant	Runoff volume (inches per year)		Estimated annual load (lbs)		% Reduction
	At 15 % IC (current)	At 11 % IC (target)	At 15 % IC (current)	At 11 % IC (target)	
Stormwater	7.23	5.90			18
Cadmium			0.8	0.7	18
Chromium			4.6	3.8	18
Copper			15	13	18
Lead			78	64	18
Zinc			187	153	18

Limitations of the Impervious Cover Method

The impervious cover (IC) method can be used to efficiently characterize water quality impairment and establish surrogate TMDL targets for % IC, or stormwater runoff volume, or pollutant reduction targets for watersheds that are impaired by stormwater (ENSR 2004). There are five limitations that affect the use of the method in Trout Brook as follows:

1. Limitation: The IC model applies to 1st through 3rd order streams.
   Effect: Trout Brook is a 1st to 2nd order stream, i.e., use of the model is appropriate.

2. Limitation: This method does not account for non-stormwater point source pollutant loadings, so it would not be appropriate where these loadings are a significant source of impairment.
   Effect: There are no non-stormwater point sources of pollution in the watershed, and violation of aquatic life criteria in this watershed is believed to be caused by stormwater and/or nonpoint source pollution, exacerbated by riparian and instream habitat disturbances. The single CSO in the watershed was disconnected in the spring of 2005 (D. Pineo, City of South Portland, pers. comm.).

3. Limitation: This method uses event mean concentrations for determination of pollutant loads. This will provide reasonable accuracy over long time periods (i.e., annual loads), but since concentrations vary significantly from storm to storm, this method should not be used for estimating loads for individual storm events.
   Effect: The method is used here only for estimating annual loads, not loads for individual storm events. In addition, it is emphasized that load estimates are primarily used for descriptive purposes (see section 3, subsection Impervious Cover Method).

4. Limitation: This method does not account for in-stream water quality processes.
   Effect: The magnitude and importance of in-stream water quality processes (e.g., leaching of naturally occurring toxicants from soil/sediment) is unknown and can therefore not be accounted for regardless of which method is used for load estimates.

5. Limitation: Additional site specific information is required for identification and specification of Best Management Practices (BMPs) to achieve TMDL goals.
   Effect: Suggestions for BMPs, remedial actions, and restoration techniques aimed at removing identified stressors, or mitigating their effects, are made in Part I, section 5. Implementation of these BMPs will aid substantially in reducing the % IC and its effects. However, a reduction of the IC by 4 % (from 15 % to 11 %) will likely require site specific information for optimal implementation of BMPs.

4. LOAD ALLOCATIONS

All Load Allocations (LAs) are given the same 9 % IC allocation as the Waste Load Allocations (WLAs) (see next section). This approach was chosen because LAs must be accounted for but it was not feasible to separate the loading contributions from nonpoint sources, background, and stormwater. Adding a margin of safety of 2 % to the 9 % Load Allocation yields the Total Allocation of 11 % IC (see Table 7 and section 6.).

5. WASTE LOAD ALLOCATIONS

The entire Trout Brook watershed is classified as a “regulated area” under the NPDES Phase II Stormwater Program. Under this program, stormwater discharges are considered as point sources and are allocated as waste loads. The only NPDES permitted discharge is one

Combined Sewer Overflow (CSO); permittee is the City of South Portland. Note that this CSO was removed in the spring of 2005.

In this TMDL, % IC is used as a surrogate for the complex mixture of stormwater runoff, pollutant and non-pollutant stressors attributable to urban development. The Total Allocation is set at 11 % IC. The ‘WLAs’ and ‘LAs’ are established at a % IC of 9 %, which allows for a margin of safety of 2 % as shown in Table 7. Resulting target pollutant (toxic contaminants) loads are also shown in the table. Again, it should be stressed that the loads as shown in Table 7 are not appropriate for use in a permitting, enforcement, or monitoring context (see Part II, section 3, subsection “Impervious Cover Method”). They are broad estimates useful in approximating relative contributions and overall load reductions. The CSO, which is permitted under the Maine PDES Program and is thus allocated a waste load, is included in Table 7 with a “0” allocation because it was removed in the spring of 2005 (D. Pineo, City of South Portland, pers. comm.).

Table 7. Estimated target annual load and waste load allocations for runoff volume and toxic contaminants in Trout Brook. (Ca, calcium; Cr, chromium; Cu, copper; Pb, lead; Zn, zinc).

	Runoff volume (inches per year)	**Pollutant load (lbs per year)**					**% reduction**
		Ca	**Cr**	**Cu**	**Pb**	**Zn**	
Combined Sewer Overflow (WLA)	0.0	0	0	0	0	0	0
Waste Load Allocations, Load Allocations (9 % IC)	4.8	0.6	3.1	11	52	125	15
Margin of Safety (2 % IC)	1.1	0.1	0.7	2	12	28	3
Total Allocation (11 % IC)	5.9	0.7	3.8	13	64	153	18

6. MARGIN OF SAFETY

This TMDL includes an explicit margin of safety of 2 % impervious cover, which accounts for the uncertainty in the selection of a numeric water quality target of 11 % IC. An implicit margin of safety is built into the choice of % IC as the TMDL target because imperviousness has a multitude of effects on streams, all of which combine to affect aquatic life. Selection of only one parameter such as toxic contaminants instead of % IC would result in a less comprehensive removal of likely stressors causing the impairment.

7. SEASONAL VARIATION

Critical conditions can occur for aquatic life and habitat in stormwater-impaired streams at both low and high flows. Frequent small storms can contribute large volumes of runoff and a mix of pollutants. High flows can cause channel alterations, increased pollutant loads from scouring and bank erosion, wash-out of biota, and high volume pollutant loading. Increased % impervious cover and the resulting increase in surface runoff reduces the amount of infiltrating rainfall that recharges groundwater. This diminished baseflow can further stress aquatic life and cause or contribute to aquatic life impairments through loss of aquatic habitat and increased susceptibility of pollutants at low flow. Because stormwater volume varies throughout the year, and stream impairment can be contributed at various flow volumes, use of the average stormwater volumes / event mean, annual mean, or other average runoff estimate to calculate an annual pollutant load is appropriate and adequately accounts for seasonal variation. Furthermore, specific BMPs implemented will be designed to address loadings during all seasons.

8. PUBLIC PARTICIPATION

Public participation in the Trout Brook TMDL development will be ensured through several avenues. A preliminary review draft TMDL, which has been reviewed by MDEP staff (M. Evers, D. Kale, L. Tsomides, J. Varricchione, Bureau of Land and Water Quality), will be distributed to watershed stakeholder organizations including

- Pat Cloutier and David Pineo, City of South Portland
- Bob Malley and Maureen O'Meara, Town of Cape Elizabeth
- Karen Young, Casco Bay Estuary Project, Portland
- Mike Doan and Joe Payne, Friends of Casco Bay, South Portland
- Betty McInnes, Cumberland County Soil and Water Conservation District
- Mac Sexton, South Portland Land Trust
- Ken Hickey, ENSR Corporation, Westford, MA
- Tom Schueler, Center for Watershed Protection, Ellicott City, MD

Paper and electronic forms of the *Trout Brook TMDL, Draft Report* will be made available for public review in three ways: the report will be available for viewing at the Augusta office of the MDEP; it will be posted on the MDEP Internet Web site; and a notice will be placed in the 'legal' advertising of a local newspaper. The following ad will be printed in the Sunday editions of the Portland Press Herald on August 21 and 28. The U.S. Environmental Protection Agency (Region I) and interested public will be provided a 30 day period (from August 19 to September 19, 2005) to respond with draft comments.

> *PUBLIC NOTICE FOR TROUT BROOK - In accordance with Section 303(d) of the Clean Water Act, and implementation regulations in 40 CFR Part 130, the Maine Department of Environmental Protection has prepared a Total Maximum Daily Load (TMDL) report (DEPLW0714) for Trout Brook in South Portland and Cape Elizabeth, Cumberland County. This TMDL report estimates the current extent of impervious cover,*

and the reductions in impervious cover and application of general stream restoration techniques required to enable the stream to meet Maine's Water Quality Criteria.

A Public Review draft of the report may be viewed at the Maine DEP Offices in Augusta (Ray Building, Hospital St., Rt. 9) or on-line at: http://www.maine.gov/dep/blwq/comment.htm.

Send all written comments by September 19, 2005 to Melissa Evers, Maine DEP, State House Station #17, Augusta, ME 04333, or email: Melissa.Evers@maine.gov

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WEB-BASED RESOURCES FOR INFORMATION ON STORMWATER ISSUES AND BEST MANAGEMENT PRACTICES

Note that this list is only a starting point and does not attempt to be comprehensive.

Center for Watershed Protection. Publications and Stormwater Management.
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